

Borexino

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Abstract

Borexino is a massive calorimetric liquid scintillation detector whose installation has been completed in the underground Gran Sasso Laboratory. The focus of the experiment is on the direct and real time measurement of the flux of neutrinos produced in the ${}^7\text{Be}$ electron capture reaction in the Sun. Furthermore, recent studies about the reduction of the ${}^{11}\text{C}$ background through suitable rejection techniques demonstrated the possibility to open an interesting additional observation window in the energy region of the pep and CNO solar neutrinos. Beyond the solar neutrino program, the detector will be also a powerful observatory for antineutrinos from Supernovae, as well as for geoneutrinos, profiting from a very low background from nuclear reactors.

1 Goals

The Borexino main goal is to detect neutrinos from the Sun via the scattering process $e^- \nu_x \rightarrow e^- \nu_x$. The neutrino signature is given by the scintillation light produced as the recoil electron deposits its energy in the medium. The detector is designed to work with a very low energy threshold (250 keV), thus providing important information on the low energy portion of the solar neutrino spectrum. Recent studies proved the capability to reduce the ${}^{11}\text{C}$ background through suitable rejection techniques and demonstrated the possibility to exploit the energy region of the pep and CNO solar neutrinos.

Borexino will also be able to observe antineutrinos coming from Supernovae and from the Earth (geoneutrinos); the detector is far away from nuclear reactors, which represent the most important background to electron antineutrino detection.

2 Status

The installation of the detector has been completed in July 2004. Several campaigns of data-taking with the empty detector have been performed in order to check the overall performance of the apparatus, DAQ, electronics and software. Some runs were performed inserting a radioactive source into the detector (i.e. a vial containing liquid scintillator loaded with Rn) to check the light collection efficiency of the detector and to test the position reconstruction algorithm. Currently (September 2006) the detector is being filled with ultra pure water and the filling with pseudocumene is foreseen starting from the end of this year. Borexino will be ready to take data by the spring of 2007.

References

- [1] Alimonti G et al. 2002 *Astroparticle Physics* B **16** 205
- [2] Borexino Web site: <http://borex.lngs.infn.it/>